Timely review

Point Defects in Solids. Volume 2: *Semiconductors and Molecular Crystals.* Edited by James H. Crawford, Jr, and Lawrence M. Slifkin. Pp. xvi+480. (Plenum: New York and London, 1975.) $45.

THE ever-increasing number of published papers on defects in semiconductors is now vast and so it is invaluable to have timely reviews available for the purpose of co-ordination and also to act as starting points for newcomers to the field.

The present volume is in reality a collection of six such review articles; these may be subdivided into two groups. The last chapter by Chadwick and Sherwood is concerned primarily with diffusion processes in molecular crystals, a topic which is obviously still in its infancy. In the penultimate chapter by Walton, the effect of defects on macroscopic properties, such as thermal conductivity of various materials is discussed: this is a specialised topic and in this sense is distinct from the earlier chapters.

The first four chapters deal primarily with the effects of radiation on crystals and contain discussions of defect creation, the structure of defects and their effects on the optical and electrical properties of the materials; there is also a chapter on impurity and self-diffusion which are of course not unrelated topics. The styles of these articles vary enormously and their contents also reflect the interests and points of view of the authors. The first by Corbett and Bourgoin is a mixture of sensible speculation, which should provoke further work, and a very comprehensive cataloguing of data, with over 400 references cited. By contrast, chapter four by Watkins on electron spin resonance is completely conservative in its approach, which is perhaps a pity, but its appeal to basic physical ideas rather than to mathematics makes it a superb addition to the literature. The other chapters by Casey and Pearson and by Curtis are of intermediate style, but nevertheless are well written and complete the area being covered.

This volume, although inevitably already somewhat dated, is most welcome, but because of its high price will probably be restricted mainly to libraries.

R. C. Newman

Gauge field theory

Gauge Theories of Weak Interactions. (Cambridge Monographs on Mathematical Physics). By J. C. Taylor. Pp. xv+167. (Cambridge University: Cambridge, London and New York, February 1976.) £10.

FOR more than 25 years quantum electrodynamics (QED) has withstood the rigours of time and increasingly sophisticated experiments, and it remains *the* most successful physical theory yet formulated. Its language is relativistic quantum field theory, and it has always suggested that other interactions of elementary particles should be described in this way. The weak interactions (typical of which is β decay) looked an especially good bet since it was anticipated that a perturbation approach would be even more accurate than QED. All earlier attempts to implement such a programme, however, foundered on the rock of 'renormalisability'. That is to say, the higher order terms in the perturbation series were incalculable because of (unrenormalisable) infinities. The development of the gauge field theories in the last few years has overcome this problem, and at the same time shown how the weak interactions may be unified with QED. This latter feature is necessary in any case, from a practical point of view, since most known weak interactions involve charged particles which interact with each other electromagnetically whether we like it or not.

It is the view of most particle physicists that this renaissance of field theory is here to stay, and this provides the motivation for John Taylor's excellent book. It is not enough to know that one can in principle calculate higher order effects in such theories, one still has to know how to do it; and this requires mathematical techniques not yet in the repertoire of most practising physicists. The technicalities of the quantisation of gauge fields using path-integral formalism and Fadeev–Popov 'ghosts' are all here. There are chapters on the renormalisation of gauge theories using the Ward-Takahashi identities and dimensional regularisation, together with more familiar material on the construction of the Weinberg-Salam model and other general models. I particularly liked the chapters on spontaneous breaking of global and local symmetries.

All of this is lucidly explained, and, even more astonishingly, in only 150 pages. This book is a 'must' for all theoreticians. I anticipate that the material will soon be in postgraduate courses, so perhaps CUP can bring out a student edition. I can pay the book no higher compliment than to say that it carries on where Bjorken and Drell leave off, and at the same high standard.

D. Bailin

Plant diseases

Plant Pathogenesis. Advanced Series in Agricultural Science, Vol. 2. By Harry Wheeler. Pp.x+106. (Springer-Verlag: Berlin, Heidelberg and New York, 1975). DM39; $16.

THE Advanced Series in Agricultural Sciences has as a basic objective the integration of theoretical and technical approaches to agriculture. Volume 2 of the Series deals with pathogenesis, described as the sequence of events that occur during the development of a disease, and is based largely on diseases of higher plants caused by fungi and bacteria. A short chapter on concepts and definitions, important for setting the scene in a book of this type, is followed by a review of mechanisms by which pathogens infect, colonise and damage plants; this and other chapters emphasise the early interactions which are likely to be critical in deciding whether or not disease will develop. The third chapter complements the second by describing the reactions of plants to pathogens and does so under the headings structural, functional and metabolic. There follows an account of disease resistance with emphasis on its induction by pathogens and on the role of phytoalexins. Chapter 5 on the Genetics of Pathogenesis deals briefly with genetics of interactions between pathogens and their hosts but also considers at about the same length the biochemistry of the specificity of these interactions. The last chapter of a few pages speculates on the nature of the response of protoplasts to pathogens. There is a good list of about 200 references and a short index.

The author has ranged over much of the field of physiological plant pathology and has presented interesting and thought-provoking assessments of many different problems which should attract much research by plant pathologists and, it is to be hoped, increasingly by scientists from other disciplines. To get the best from this book the reader needs to know a fair amount about the many and various subjects which are reviewed and discussed. This, however, should not in any way deter the many others who will find in this book a very readable and informative account of most of the basic problems in plant pathology that relate to how microorganisms cause disease in plants or, more often, do not do so.

R. K. S. Wood